

BAB VI

PERHITUNGAN BALOK B1

6.1 Properties Balok B1

Data - data : $b := 150 \text{ mm}$ Tulangan utama D13 mm
 $h := 300 \text{ mm}$
 $d := h - (40 + 10 + 0.5 \cdot 13) = 243.5 \text{ mm}$
 daksen := $h - d = 56.5 \text{ mm}$
 $f_c := 20.75 \text{ Mpa}$ $\beta := 0.85$
 $f_y := 390 \text{ Mpa}$

$$\rho_b := 0.85 \cdot \beta \cdot \frac{f_c}{f_y} \cdot \left(\frac{600}{600 + f_y} \right) = 0.02$$

$$\rho_{\max} := 0.75 \rho_b = 0.017$$

$$\rho_{\min} := \frac{1.4}{f_y} = 0.0036$$

$$m := \frac{f_y}{0.85 \cdot f_c} = 22.11$$

Dari output ETABS didapat :

Mutump := 21.3095 kNm

Mulap := 33.4047 kNm

6.2 Perhitungan Tulangan Lentur Tumpuan

ambil $\delta := 0.4$

$$M_n := \frac{\text{Mutump} \cdot 10^6}{0.8} = 26636875 \text{ Nmm}$$

$$R_n := \frac{(1 - \delta) M_n}{b \cdot d^2} = 1.797 \text{ N/mm}^2$$

$$(\rho - \rho_{\text{aksen}}) := \frac{\left(1 - \sqrt{1 - \frac{2m \cdot R_n}{f_y}} \right)}{m} = 0.0049$$

$$\rho_{\text{aksen}} := \frac{\delta \cdot M_n}{f_y \cdot (d - \text{daksen}) \cdot b \cdot d} = 0.004$$

$$\rho := 0.0049 + 0.004 = 0.0089 > \rho_{\min} = 0.0036$$

$$A_{\text{perlu}} := \rho \cdot b \cdot d = 325.07 \text{ mm}^2$$

$$A_s := 0.785 \cdot 13^2 \cdot 4 = 530.66 \text{ mm}^2$$

$$s1 := \frac{(150 - 80 - 20 - 2 \cdot 13)}{2 - 1} = 24 \text{ mm} \quad \blacksquare > \blacksquare \quad 25 \text{ mm} \quad \text{OK!!}$$

$$A_{s_{\text{aksenperlu}}} := \rho_{\text{aksen}} \cdot b \cdot d = 146.1 \text{ mm}^2$$

$$A_{st} := 0.785 \cdot 13^2 \cdot 2 = 265.33 \text{ mm}^2$$

pasang tul tarik 4D13 dan tulangan tekan 2D13

6.3 Perhitungan Tulangan Lentur Lapangan

$$\text{ambil } \delta := 0.4$$

$$M_n := \frac{\text{Mulap} \cdot 10^6}{0.8} = 41755875 \text{ Nmm}$$

$$R_n := \frac{(1 - \delta)M_n}{b \cdot d^2} = 2.82 \text{ N/mm}^2$$

$$(\rho - \rho_{\text{aksen}}) := \frac{\left(1 - \sqrt{1 - \frac{2m \cdot R_n}{f_y}}\right)}{m} = 0.0079$$

$$\rho_{\text{aksen}} := \frac{\delta \cdot M_n}{f_y \cdot (d - d_{\text{aksen}}) \cdot b \cdot d} = 0.0063$$

$$\rho := 0.0079 + 0.0063 = 0.0142 \quad \blacksquare > \blacksquare \quad \rho_{\text{min}} = 0.0036$$

$$A_{s_{\text{perlu}}} := \rho \cdot b \cdot d = 518.66 \text{ mm}^2$$

$$A_s := 0.785 \cdot 13^2 \cdot 4 = 530.66 \text{ mm}^2$$

$$s1 := \frac{(150 - 80 - 20 - 2 \cdot 13)}{2 - 1} = 24 \text{ mm} \quad \blacksquare > \blacksquare \quad 25 \text{ mm} \quad \text{OK!!}$$

$$A_{s_{\text{aksenperlu}}} := \rho_{\text{aksen}} \cdot b \cdot d = 229.02 \text{ mm}^2$$

$$A_{st} := 0.785 \cdot 13^2 \cdot 2 = 265.33 \text{ mm}^2$$

pasang tul tarik 4D13 dan tulangan tekan 2D13

6.4 Perhitungan Tulangan Geser Balok

$$V_c := \frac{\sqrt{f_c} \cdot b \cdot d}{6} = 27729.88 \text{ N}$$

$$V_u := 50175 \text{ N}$$

$$V_c = 27729.88 \text{ N}$$

$$V_s := \frac{V_u}{0.75} - V_c = 39170.12 \text{ N} \quad \text{Perlu tulangan geser !!}$$

$$\text{Bila dipasang tulangan } \Phi 10 \text{ sebagai sengkang, } A_v := 2 \cdot 0.785 \cdot 10^2 = 157 \text{ mm}^2$$

$$f_y := 240 \text{ Mpa}$$

$$s_v := \frac{A_v \cdot f_y \cdot d}{V_s} = 234.24 \text{ mm}$$

sehingga dipakai tulangan geser tumpuan $\phi 10 - 150$ dan lapangan $\phi 10 - 200$